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Phyical and molecular characterization of a genetic switch[1]
LAURA FINZI, CHIARA ZURLA[2], CARLO MANZO[3], HAOWEI WANG, Emory University, DAVID DUNLAP, Emory School of Medicine — The lambda bacteriophage epigenetic switch determines the growth lifestyle of the virus after infection of its host (*E. coli*). It is now clear that the switch consists of a ∼2.3 kbp-long DNA loop mediated by the lambda repressor protein. Using tethered particle microscopy (TPM), magnetic tweezers and AFM, our laboratory has novel, direct evidence of loop formation and breakdown by the repressor, the first characterization of the thermodynamics and kinetics of the looping reaction and its dependence on repressor non-specific binding and DNA supercoiling. These *in vitro* data provide insight into the different possible nucleoprotein complexes and into the lambda repressor-mediated looping mechanism which leads to predictions for that *in vivo*. The significance of this work consists not only of the new insight into the physical parameters at the basis of a paradigmatic epigenetic switch that governs lysogeny vs. lysis, but also the detailed mechanics of regulatory DNA loops mediated by proteins bound to multipartite operators and capable of different levels of oligomerization.

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[2]Present Address: GATech
[3]Present Address: IBEC, BArcelona, Spain

Laura Finzi
Emory University

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